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54 Rechargeable batteries and chargers therefor.

57 The present invention relates to rechargeable batteries and chargers therefor, the battery preferably being suitable for fast-charging and having a

band detectable by the charger to indicate to the charger that a different rate of charging should be applied to the battery.

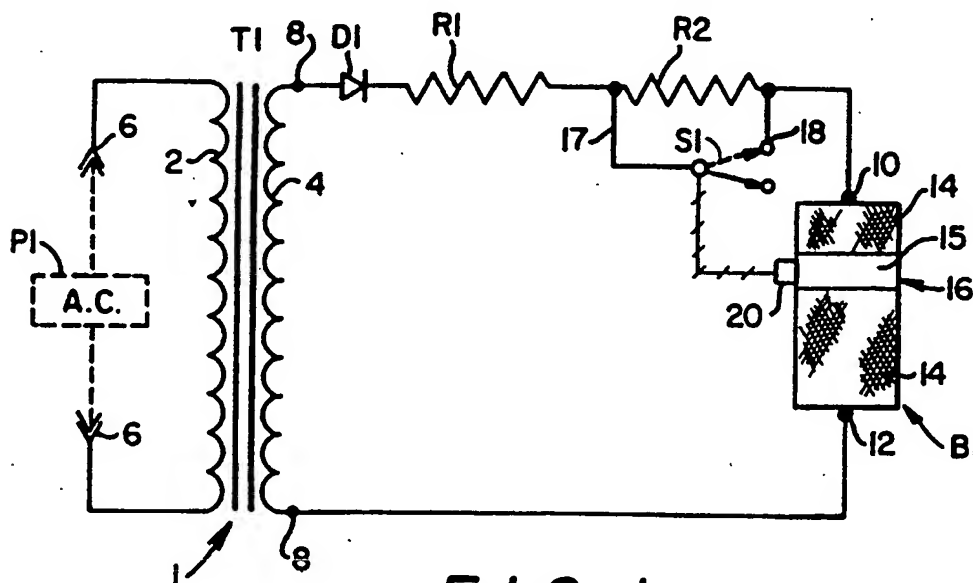


FIG. 1

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EUROPEAN SEARCH REPORT

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EP 90 30 7437

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-A-3 637 669 (ROBERT BOSCH GMBH) * abstract * * column 1, line 34 - line 44 * * column 3, line 30 - line 41; figure 4 *	1-3, 5, 8, 12	H02J7/04
Y	---	4, 6, 7, 9-11	
X, D	US-A-4 628 243 (J. HODGMAN) * column 2, line 60 - column 5, line 49; figures 1-4 *	1, 2, 8	
Y	---	7, 10, 11	
Y	US-A-4 602 203 (H. BRAGDON) * column 5, line 18 - line 27; figure 6 *	4	
Y	US-A-3 193 750 (S. CHAIT) * column 2, line 23 - column 3, line 6 *	6	
Y	EP-A-0 293 664 (POWER-TECH SYSTEMS CORPORATION) * column 1, line 35 - line 48 * * column 4, line 17 - line 31 * * column 4, line 42 - line 54 * * figure 2 *	7	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
Y, D	US-A-3 506 902 (J. SULLIVAN) * column 2, line 9 - column 3, line 5; figure 1 *	9-11	H02J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 DECEMBER 1991	Examiner HELOT H. V.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- A : member of the same patent family, corresponding document			

the circuit. In the closed position (shown by broken lines), switch S1 would short resistor R2 and remove it from the circuit. The value of resistor R1 and resistor R2 is selected to provide a current that could be in the range of a trickle charge, while R1 is selected so that if it were used alone the current charge would be in the range of a fast charge.

A detector means 20, such as a mechanical or electrical device, activates switch S1 when it detects the annular exposed area 15 of the conductive container 16 of battery B1. Detector means 20 could be a conventional device which could detect a conductive area and thereby complete a circuit that would deliver a current to activate switch S1 or it could be a magnetic device that upon detecting a magnetic band would activate switch S1.

In the operational mode, once the battery B1 is inserted into the charger device 1 and contacts the terminals 10 and 12, the circuit will be complete and permit charging current to flow through battery B1. If the detector means 20 detects the annular exposed area 15, switch S1 will be activated to the closed position (shown by broken lines) thereby effectively removing resistor R2 from the circuit. With resistor R2 removed from the circuit, the charging current will increase and provide a quick charge to battery B1. On the other hand, if the annular exposed area 15 is not provided in battery B1, then switch S1 will remain in the open position (shown by solid line) and resistors R1 and R2 would remain in series in the circuit and provide a trickle charge to the battery.

Figure 2 shows another embodiment of the invention in which a transformer T2 comprises primary winding 20 and secondary winding 22. The primary terminals 24-24 are adapted to connect to an alternating current power supply P2. One secondary terminal 26 is connected to diode D2 which in turn is connected in series with resistor R3. The opposite end of resistor R3 is connected to one output terminal 28 while the other output terminal 30 is connected to the secondary terminal 32 of transformer T2. Output terminals 28-30 are adapted to receive a rechargeable battery B2. With a battery B2 inserted in output terminals 28-30 of the charger device 21 and with an alternating current connected to primary terminals 24-24, a charge current flows into the rechargeable battery B2.

One end of a first electrical contact 34 is connected to terminal 26 of the secondary winding 22 with its opposite end connected to one end of switch S2. The opposite end of switch S2 is connected to the midpoint of the secondary winding 22. Switch S2 is normally in the closed position (shown by solid line) so that current induced in the secondary winding 22 will comprise only half the winding. Connected to switch S2 is detector means 38 which operates switch S2 when it detects the

annular exposed area 15 of conductive container 16 of battery B1. With the switch S2 in the normal closed position (shown by solid line), one half of the winding in the secondary winding 22 will be shorted, producing only a trickle charge to battery B2.

Battery B2 is identical to battery B1 of Figure 1 and has its insulating jacket 14 cut to provide an annular exposed area 15 of the conductive container 16 of battery B2. In the operational mode, a battery B2 is inserted into the charger device 21 to contact terminals 28-30 thereby completing the circuit of the charger. Resistor R3 is selected so that the charger provides a selected current charge (trickle charge) to battery B2.

If detector 38 detects the annular exposed area 15 of battery B2, switch S2 will be activated to the open position (shown by broken lines), thereby effectively including the remaining one-half of the secondary windings into the circuit so that the full secondary winding is in the circuit. This will result in charging the charging current of the circuit to a fast charge rate. Thus a different charging current is provided to battery B2 if an indicator band such as the annular exposed area 15 is sensed by detector 38.

It will be appreciated that the invention may be modified in any suitable manner by one skilled in the art, beyond those embodiments described above. For example, a magnetic operating switch could be used to shunt resistor R1 in Figure 1, when in the closed position, and the switch could respond to the detection of a magnetic material. Thus, when the indicator band on the rechargeable battery is a magnetic band and when the rechargeable battery is placed in the charger device, the magnetic band could activate the magnetic switch to the closed position, thereby shunting resistor R2 from the circuit. Another example would be to use a photocell switch that would be responsive to the reflection of the emitting light of the photocell. Thus the indicator band on the rechargeable battery might be a reflective band so that, when the rechargeable battery is inserted into the charger device, the light from the photocell would be reflected, thereby operating a conventional switch that would shunt a resistor or a portion of the windings in the secondary winding of the transformer in the circuit.

Claims

1. A battery charging device for charging at least one rechargeable battery, the device being adapted to recognise a marked battery and to provide a specified charging rate to the marked battery, characterised in that the device is adapted to re-

cognise at least one band on the battery and to charge the battery via its output terminals.

2. A device according to claim 1, wherein the device is adapted to charge any suitable battery at a rate appropriate to the battery type, the device only charging at the specified rate when a marked battery, preferably a fast-charging battery, is recognised.

3. A device according to claim 1 or 2, wherein the device is adapted to provide two or more specified charging rates, the rate preferably being determined by size of battery and/or characteristics of the band.

4. A device according to any preceding claim, further comprising a timer to terminate charging, preferably according to the charging rate and/or battery characteristics.

5. A device according to any preceding claim, wherein the device is adapted to recognise a conductive band, a magnetic band and/or a reflective band on the rechargeable battery.

6. A device according to any preceding Claim, wherein the charge is provided by means comprising a transformer with primary windings adapted to be coupled to an alternating power source, secondary windings coupled to rectifier means and resistive means so as to provide a circuit for supplying current to charge the rechargeable battery; and wherein a portion of the resistive means is shunted from the charging circuit when the device recognises an indicator band on a rechargeable battery.

7. A device according to any of claims 1 to 5, wherein the charge is provided by means comprising a transformer with primary windings adapted to be coupled to an alternating power source, secondary windings coupled to rectifier means and resistive means so as to provide a circuit for supplying current to charge the rechargeable battery; and wherein the full secondary windings are adapted to be included when the device recognises an indicator band on a rechargeable battery.

8. A rechargeable battery as defined in any preceding claim for use with a device according to any preceding claim.

9. A battery according to claim 8, comprising a conductive container wrapped with an insulative material, the insulative material being separated to expose a portion of the conductive container, preferably at a location different from the midpoint of the longitudinal axis expose an annular area of the conductive container, the exposed portion of the conductive container forming the indicator band.

10. A battery according to Claim 8 or 9, wherein the battery is a cylindrical rechargeable battery.

11. A battery charger system comprising a device according to any one of claims 1 to 7 and a battery according to any one of claims 8 to 10.

12. A battery charger system adapted to provide a

least two different rates of charging currents to rechargeable batteries and adapted to distinguish which rechargeable battery of similar size batteries should get which rate of charge current, the battery charger system comprising a rechargeable battery having a positive terminal and a spaced-apart negative terminal for delivering power and having an indicator band disposed between the positive terminal and the negative terminal to indicate the preferred charge rate of current the rechargeable battery can accommodate: a charging device comprising current means for delivering at least two different rates of charging current; and detection means for sensing the presence and location of the indicator band in the rechargeable battery and for directing the current means to provide a specific rate of charging current to the rechargeable battery depending on the presence and location of the indicator band on the rechargeable battery, said device and/or battery optionally further comprising any one or more features as defined in any preceding claim, in any suitable combination.